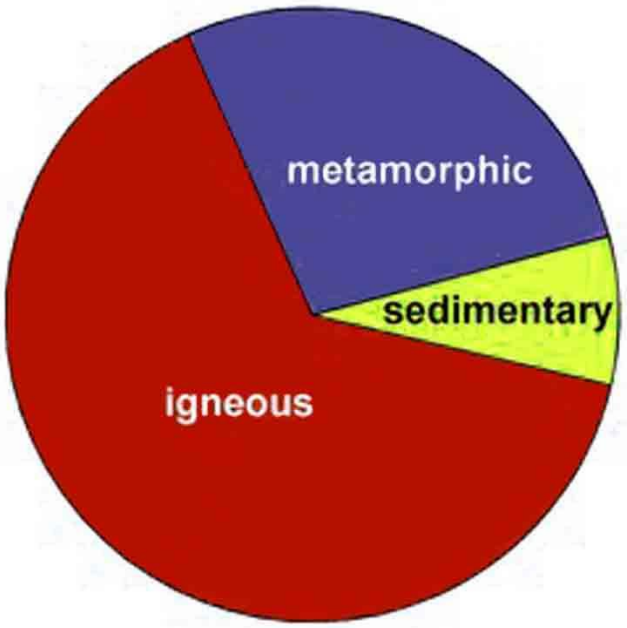
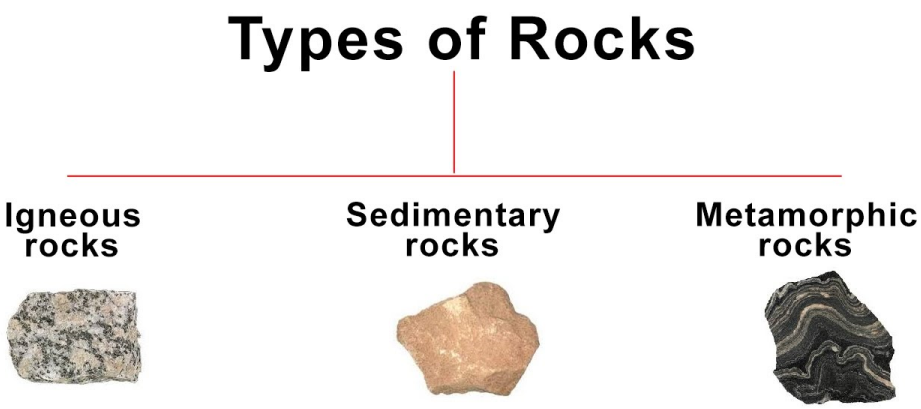
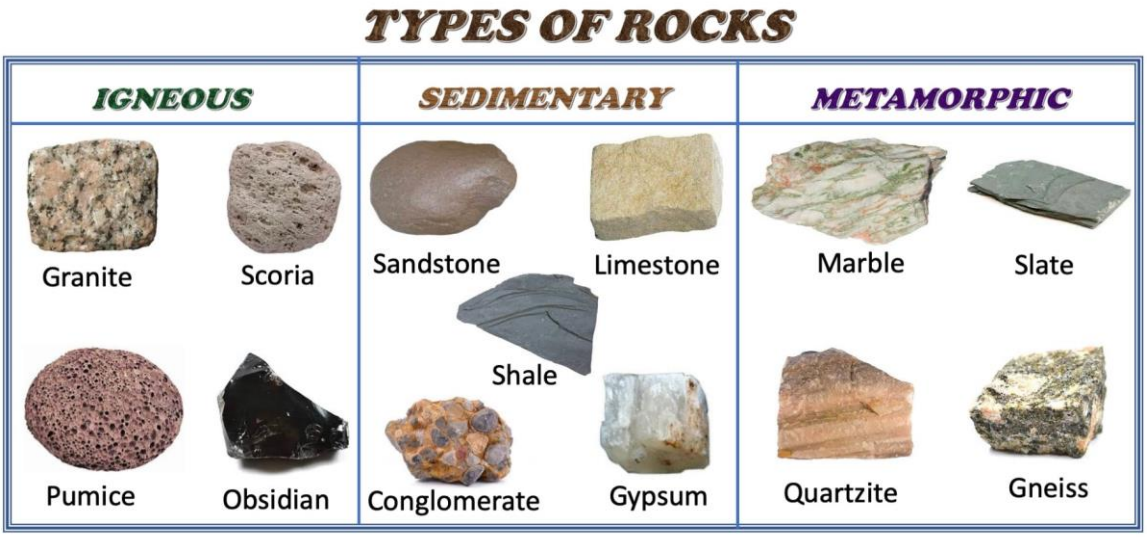
Rocks



- ✓ Rocks are an aggregate of one or more minerals held together by chemical bonds
- ✓ Feldspar and quartz are the most common minerals found in rocks.
- ✓ Silicon and oxygen are major elements of all types of feldspar. It is commonly used in ceramics and glass making.
- ✓ Quartz:It is one of the most important components of sand and granite. They are used in the manufacturing of radio, radar, etc.
- ✓ The scientific study of rocks is called petrology.
- ✓ Based on the mode of formation three major groups of rocks are defined: igneous, sedimentary, and metamorphic.





Igneous Rocks or Primary Rocks

- ✓ The solidification of magma formed the first rocks on earth.
- ✓ Rocks formed out of solidification of magma (molten rock below the surface) and lava (molten rock above the surface) and are known as igneous or primary rocks.
- ✓ Having their origin under conditions of high temperatures the igneous rocks are unfossiliferous.
- ✓ Granite, gabbro, basalt, are some of the examples of igneous rocks.
- ✓ There are two types of rocks based on the presence of acid-forming radical, silicon, acidic rocks and basic rocks.

Melting & Crystallization

- ✓ The three rocks are carried down to the deeper regions of the Earth by a process known as Subduction.
- ✓ Under intensely high temperatures the Sedimentary and Metamorphic rocks lose their solidity and get converted into lava or molten magma. This process is known as melting. It generally occurs at the core of the Earth where the temperature is immense.
- ✓ When the molten lava or magma cools down, its molecules get arranged uniformly and get solidified. This is known as the crystallization process.
- ✓ Igneous or Magmatic rocks are formed through this process.
- ✓ Thus, Melting and Crystallization are the main processes resulting in the formation of the Igneous or Magmatic rocks.

Acidic Rocks

1. Acidic rocks are characterised by high content of silica (quartz and feldspar) — up to 80 per cent.
2. The rest is divided among aluminium, alkalis, magnesium, iron oxide, lime etc.
3. These rocks have a lesser content of heavier minerals like iron and magnesium. Hence, they are less dense and are lighter in colour than basic rocks.
4. These rocks constitute the sial portion of the crust.
5. Due to the excess of silicon, acidic magma cools fast, and it does not flow and spread far away.
6. High mountains are formed of this type of rock.
7. Add rocks are hard, compact, massive and resistant to weathering.
8. Granite, quartz and feldspar are typical examples.

Basic Rocks

1. These rocks are poor in silica (about 40 per cent); magnesia content is up to 40 per cent, and the remaining is spread over iron oxide, lime, aluminium, alkalis, potassium etc.
2. Due to low silica content, the parent material of such rocks cools slowly and thus, flows and spreads far away. This flow and cooling give rise to plateaus.
3. Presence of heavy elements imparts to these rocks a dark colour. Not being very hard, these rocks are weathered relatively easily.
4. Basalt, gabbro and dolerite are typical examples.

Sedimentary Rocks or Detrital Rocks

1. Sedimentary rocks are formed by lithification — consolidation and compaction of sediments.
2. Hence, they are layered or stratified of varying thickness. Example: sandstone, shale etc.
3. Sediments are a result of denudation (weathering and erosion) of all types of rocks.
4. These types of rocks cover 75 per cent of the earth's crust but volumetrically occupy only 5 per cent (because they are available only in the upper part of the crust).
5. Ice deposited sedimentary rocks are called till or tillite. Wind-deposited sediments are called loess.

Erosion and Deposition

- ✓ Erosion is a natural phenomenon in which rocks are eroded or are washed away by natural forces such as wind, flowing water, etc.
- ✓ Such eroded particles would get deposited at certain obstacles and would form Sedimentary rocks.
- ✓ Thus erosion and deposition are the main processes resulting in the formation of Sedimentary rocks.

Depending upon the mode of formation, sedimentary rocks are classified into:

mechanically formed — sandstone, conglomerate, limestone, shale, loess.
organically formed — geyserite, chalk, limestone, coal.
chemically formed — limestone, halite, potash.

Mechanically Formed Sedimentary Rocks

They are formed by mechanical agents like running water, wind, ocean currents, ice, etc.
E.g. sandstone.
E.g. claystone and shales

Chemically Formed Sedimentary Rocks

Water containing minerals evaporate at the mouth of springs or salt lakes and give rise to Stalactites and stalagmites (deposits of lime left over by the lime-mixed water as it evaporates in the underground caves).

Organically Formed Sedimentary Rocks

The remains of plants and animals are buried under sediments, and due to heat and pressure from overlying layers, their composition changes. Coal and limestone are well-known

Metamorphic Rocks

1. The word metamorphic means 'change of form'.
2. Metamorphism is a process by which recrystallisation and reorganisation of minerals occur within a rock. This occurs due to pressure, volume and temperature changes.
3. When rocks are forced down to lower levels by tectonic processes or when molten magma rising through the crust comes in contact with the crustal rocks, metamorphosis occurs.
4. In the process of metamorphism in some rocks grains or minerals get arranged in layers or lines. Such an arrangement is called foliation or lineation.
5. Gneissoid, slate, schist, marble, quartzite etc. are some examples of metamorphic rocks.

Some examples of Metamorphosis

Igneous or Sedimentary rock	Influence	Metamorphosed rock
Granite	Pressure	Gneiss
Clay, Shale	Pressure	Schist
Sandstone	Heat	Quartzite
Clay, Shale	Heat	Slate ==> Phyllite
Coal	Heat	Anthracite ==> Graphite
Limestone	Heat	Marble

Metamorphic Rocks in India

The gneisses and schists are commonly found in the Himalayas, Assam, West Bengal, Bihar, Orissa, Madhya Pradesh and Rajasthan.

Quartzite is a hard rock found over Rajasthan, Bihar, Madhya Pradesh, Tamil Nadu and areas surrounding Delhi.

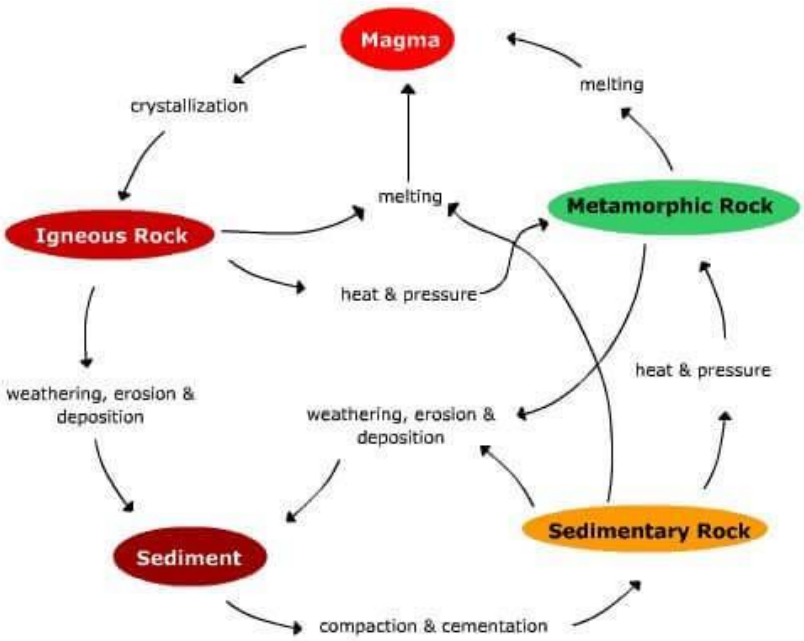
Marble occurs near Alwar, Ajmer, Jaipur, Jodhpur in Rajasthan and parts of Narmada Valley in Madhya Pradesh.

Slate, which is used as a roofing material and for writing in schools, is found over Rewari (Haryana), Kangra (Himachal Pradesh) and parts of Bihar.

Graphite is found in Orissa and Andhra Pradesh.

Rock cycle

- ✓ Rock Cycle can be defined as the transition between different types of rocks from one another by undergoing various physical and chemical changes under the influence of various natural forces.
- ✓ Igneous rocks are primary rocks, and other rocks form from these rocks.
- ✓ Igneous rocks can be changed into sedimentary or metamorphic rocks.
- ✓ The fragments derived out of igneous and metamorphic rocks form into sedimentary rocks.
- ✓ Sedimentary and igneous rocks themselves can turn into metamorphic rocks.
- ✓ The crustal rocks (igneous, metamorphic and sedimentary) may be carried down into the mantle (interior of the earth) through subduction process and the same meltdown and turn into molten magma, the source for igneous rocks



MCQ

Which one of the following are the two main constituents of granite?
(a) Iron and nickel
(b) Iron and silver
(c) Silica and aluminium
(d) Iron Oxide and potassium

Which one of the following is the salient feature of metamorphic rocks?
(a) Changeable
(b) Quite
(c) Crystalline
(d) Foliation

Which one of the following is not a single element mineral?
(a)Gold
(b) Mica
(c) Silver
(d) Graphite

Mica is a group of silicate minerals; Graphite is a naturally-occurring form of crystalline carbon

Which one of the following is the hardest mineral?
(a)Topaz
(b)Quartz
(c)Diamond
(d)Feldspar

Which one of the following is not a sedimentary rock?
(a)Tillite
(b)Breccia
(c)Borax
(d)Marble

Question	Answer
1	c
2	d
3	b
4	c
5	d

Note:Foliation in geology refers to repetitive layering in metamorphic rocks. Each layer can be as thin as a sheet of paper, or over a meter in thickness. The word comes from the Latin folium, meaning "leaf", and refers to the sheet-like planar structure.